

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/673185✓

INTERNATIONAL APPLICATION NO.

PCT/BR00/00022✓

INTERNATIONAL FILING DATE

17 March 2000✓

PRIORITY DATE CLAIMED

17 March 1999✓

TITLE OF INVENTION

TAMPON

APPLICANT(S) FOR DO/EO/US :

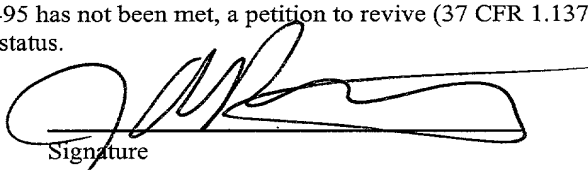
Igor Philip Passos Proglhof✓

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

U.S. APPLICATION NO (if known, see 37 CFR 1.5) 09/673185		INTERNATIONAL APPLICATION NO PCT/BR00/00022		ATTORNEY'S DOCKET NUMBER J&J 1796	
17. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):				CALCULATIONS PTO USE ONLY	
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..... \$1070.00					
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO.....\$930.00					
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.455(a)(2)) paid to USPTO..... \$790.00					
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... \$720.00					
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)..... \$98.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$ 930.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	22 - 20 =	2	x \$18.00	\$36.00	
Independent claims	3 - 20 =	0	x \$80.00	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$966.00	
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$	
SUBTOTAL =				\$966.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$966.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$	
TOTAL FEES ENCLOSED =				\$966.00	
				Amount to be refunded:	\$
				charged:	\$966.00
a. <input type="checkbox"/> A check in the amount of \$ _____ to cover the above fees is enclosed.					
b. <input checked="" type="checkbox"/> Please charge my Deposit Account No. <u>10-0750/J&J1796/JAR</u> in the amount of \$966.00 to cover the above fees. A duplicate copy of this sheet is enclosed.					
c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>10-0750/J&J1796/JAR</u> . A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO:					
Philip S. Johnson, Esq. Johnson & Johnson One Johnson & Johnson Plaza New Brunswick, NJ 08933-7003 USA					
 Signature Joel A. Rothfus Reg. No. 33,277 Attorney for Applicants					

S/PRTS

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09/673185

529 Rec'd PCT/PTC 12 OCT 2000

Title: "TAMPON"

5 The present invention refers to an internal absorbent, also known as a tampon, being particularly used for absorbing and holding vaginal exudes, such as menstrual blood and intermenstrual secretions.

Description of the prior art

10 Tampons, in general, are known from the prior art and usually comprise a body made of an absorbent material having a substantially cylindrical shape, suitable for introduction into the vaginal cavity. According to some references in the state of the art, a tampon may be cylindrical and curved, and the context of the present invention should be understood in this sense.

Usually, such tampons are provided with a cord projecting from one of its ends, which is intended to facilitate the removal of the tampon out of the vaginal cavity after its use.

15 As a rule, the absorbent body of tampons are made of absorbent fibers such as cotton fibers, and may include a superabsorbent material, in order to increase the efficiency of holding liquids in said absorbent body.

20 The absorbent body is manufactured from a substantially rectangular web of absorbent fibers, first transversely folded and then rolled up so as to form a cylindrical piece, still with the same consistency of the absorbent fibers.

The tampons from the prior art may also comprise a film of non-woven fabric superposed on one of the surfaces of the web of absorbent fibers, in order to involve the absorbent material and impart greater consistency to it, when said web is rolled up.

Before rolling up the absorbent web, the cord is interwoven at the fold of the web and remains interwoven with the web while the latter is being rolled up, thus remaining permanently fixed to the absorbent body.

Then, the absorbent body undergoes a radial compaction process, whereby the tampon is formed.

The compaction, described in patent documents such as US 3,422,496 and EP 422,660, is carried out by a press provided with multiple blades (also called "jaw"), which are radially arranged and apply force to the absorbent body containing the cord, thus compacting said body, providing longitudinal grooves in this body and forming the tampon.

The material presently used in manufacturing the cord, typically cotton, has low elasticity and may be cut during the process of compacting the absorbent body with said blades.

That is to say, the cord may be damaged when the compaction of the absorbent material occurs in conjunction with said cord, and the force applied by the blades to said absorbent material is transferred to the cord, which might break or weaken the filaments of this cord, resulting in a failure of the product.

In spite of the very low probability of this problem occurring, the great drawback is that this damage or cut is not detected before the need for using the cord, that is, at the time of removing the tampon from the vaginal cavity.

Objective of the Invention

One of the objectives of the present invention is to provide a tampon with an elastic or extensible cord that will not be broken or damaged at the time of compacting the absorbent body, replacing the cotton cord, which has been used lately. This objective is achieved by means of a tampon, particularly a tampon for holding vaginal exudates, which comprises a substantially cylindrical absorbent body, preferably provided with longitudinal grooves in its surface and comprising a cord associated to the absorbent body, suitable for handling said tampon, the cord comprising synthetic fibers, preferably textured (crimped).

As used herein, an "elastic cord" is one provided with a higher or lower degree of property of quickly tending to return to its original dimensions, after removal of the force that is causing its elastic deformation. An "extensible cord" is one provided with the property

of extending or elongating without substantially permanent plastic deformation under application of a specific force. The cord of the invention may be either elastic or extensible without being elastic.

5 A further objective of the present invention is to provide a method of manufacturing a tampon using an extensible or elastic cord that will replace the cotton cord used at present. This objective is achieved by means of a method of manufacturing a tampon, particularly a tampon for holding vaginal exudates, comprising a substantially cylindrical absorbent body provided with longitudinal grooves in its surface and comprising a cord suitable for handling said tampon, associated with the absorbent body, the method comprising
10 the steps of cutting a substantially rectangular portion of a web of an absorbent material, folding the absorbent web, interweaving the cord at the folded end of the web, rolling up the web to form the absorbent body, compacting the absorbent body by means of blades of a press, the cord being textured. Preferably, the process of the present invention involves a step of superposing a non-woven material on a surface of the web of absorbent material,
15 after the step of cutting a substantially rectangular portion of said web of absorbent material.

The tampon cord of the present invention preferably comprises textured synthetic fibers. The textured fibers and/or the cord when tested for tensile strength and elongation properties, such as by the standardised test methods ASTM D-2256 and D-3822,
20 exhibit a multi-phase, tensile stress-strain curve having an inflection point between a first and second phase. A typical stress-strain curve is a plot of the amount of stress applied to the material versus the amount of strain the material is undergoing. "Stress" is defined as force per unit original area, while "strain" is the amount of elongation over the original length. The slope of the stress-strain curve in the linear region of the plot is a measure of
25 the material's elasticity. The slope measurement is referred to as "Young's modulus".

During the first phase, the fibers are extended, or "straightened out". That is, texture is removed from the fibers. There is considerable strain or elongation under a relatively low amount of stress, thus providing a first Young's modulus value. The second phase begins after the fibers are totally extended. In the second phase, a much greater amount of
30 force is required to elongate the fibers. The material in the second phase will undergo a limited amount of elongation without permanent (plastic) deformation. Once the yield point, or point wherein deformation transitions from elastic deformation to plastic deformation, is reached, the elongation will be permanent and will alter the cross-sectional area of the ma-

terial. The second phase provides a second Young's modulus, which is greater than the first Young's modulus.

Synthetic fibers of similar chemical make-up in the absence of any texture will typically exhibit only a single-phase stress-strain curve that substantially corresponds to the second phase, as described above. Thus, one effect of the texture is to allow the material to be extended a much greater extent prior to undergoing plastic deformation, to a point of material failure.

Preferably, the material used in manufacturing the cord is polypropylene, polyester or nylon fibers or mixtures thereof, these fibers being subjected to a texturing process.

The texturing process is a physical-chemical treatment applied to threads of synthetic continuous fibers. This treatment aims at modifying the aspect, characteristics and properties of the fibers, usually causing them to be more elastic or extensible, due, partly or totally, to the fixation of folds or curves along the length of the fibers, for instance by means of heat. In other words, the linearity of the fibers is altered in a substantially permanent way.

Those skilled in the art know how to chose the process for obtaining texturing of fibers. Among the texturing processes known from the prior art, generically described in the literature of textile technology, the following can be pointed out: the continuous process, the false twist process, the modified false twist process, the process with a press-down chamber, the "spunize" process, the process with metallic blade, the "crinkle" process, the stuffer box process, the sterical buckling process and the air-blow process.

The fibers used to make the cord of the invention may be manufactured by any of the above processes, the air-blow process being the preferred one, which consists in interweaving the fibers at a high speed under application of hot or cold air to the fibers, the latter having been previously wetted with hot water.

The cord of the invention is composed of a set of fibers, preferably a set of cables of twisted fibers which, in turn, are joined together to compose the cord. Preferably, the number of fibers per cable ranges between about 30 and about 200. Preferably, the number of cables to form the cord ranges between about 8 and about 25, more preferably, about 12; preferably, the number of twist of the cables ranges between about 50 and about 250, more preferably, about 120; preferably the cables have dtex ranging between about 100 and about 200 (dtex being the weight in grams of 10,000 meters of cable).

The cord of the invention exhibits an elastic or non-elastic extensibility (calculated as the difference between the final length and the initial length divided by 100) higher than about 25%, preferably between about 30% and about 200, and more preferably between about 40% and about 60%.

5 In a preferred embodiment of the present invention, the cord is provided with a partly or totally fluid-repelling characteristic, for instance, by dipping it into a bath of a hydrophobic or fluid-repelling substance. This characteristic aims at preventing the blood absorbed by the tampon from contacting the cord, which would convey to the wearer a feeling of moisture and a little attractive visual aspect. It may also be dyed to a desired color.

10 Description of the Drawings

The present invention will now be described in greater detail with reference to an embodiment represented in the drawings. The accompanying figures have been made purposely without exact measures or proportions, because they are given by way of example.

15 Figure 1 is a perspective view of the tampon and cord according to the present invention.

Figure 2 is a view of a step of manufacturing the tampon after one folding of the web.

Figure 3 is a view of another step of manufacturing the tampon illustrated in figure 1, prior to the process of pressing the web, after rolling it up.

20 Figure 4 is a simplified representation of the press used for compacting the absorbent body when the compacting blades are open.

Figure 5 is a simplified representation of the press used for compacting the absorbent body when the compacting blades are closed.

25 Figure 6 is a view of the web of the tampon shown in figure 1, open after pressing; and

Figure 7 is a graph of the behavior of materials subjected to deformation.

Detailed Description of the Figures

As can be seen from figure 1, the tampon 1 comprises a substantially cylindrical absorbent body 3 having longitudinal grooves 4 in its surfaces and comprising a cord 5. The end 2 is substantially rounded or ogival in shape.

5 As known from the prior art, the absorbent body 3 is manufactured from a web of an absorbent material, for instance, cotton fibers mixed with rayon fibers cut with dimensions of approximately of 235 mm long and 50 mm broad, forming an absorbent web 10.

10 A film of non-woven material 11 is superposed on one of the surfaces of the web 10, as can be seen from figures 2 and 3. The film 11 is longer than the length of the absorbent body 3.

During the process of manufacturing the web 10, the latter is asymmetrically folded over itself, as shown in figure 2. The cord 5 is interwoven in the fold D of the web 10, and the ends of this cord are fixed with a knot 6.

15 Then, the web 10 is rolled up to form an absorbent body 3, as illustrated in figure 3. The part of the film 11 longer than the length of the absorbent body 3 is used to overlap the outer surface of the body 3, maintaining the web 10 rolled-up.

20 The absorbent body 3 is then passed through a press 40 and is compressed in order to mold the material into a cylindrical-ogival shape. Preferably, the end 2 of the tampon 1 is molded as an ogive, so that the tampon will have a rounded end, which facilitates its introduction into the vaginal cavity. The cord 5 projects from the opposite end of the tampon 1, as shown in figure 1.

The absorbent body 3 in conjunction with the cord 5 is then subjected to compaction.

25 As illustrated in figures 4 and 5, the press 40 is provided with a plurality of blades 41, which are moved radially towards the center of the press 40 (see figure 5), thus compressing the surface of the absorbent body 3, which remains with grooves 4 arranged longitudinally at the place where said blades 41 contact said absorbent body 3.

30 Thus, the cord 5 used at present might be damaged or even broken, in which case the tampon would be defective. As shown in figure 6, which illustrates a tampon 1, which has been unfolded after the pressing step, the cord 5 is capable of receiving higher

pressures, extending at the points 20, that is to say, in the regions where the blades 41 of the press 40 penetrate more deeply.

Thus, according to a preferred embodiment of the present invention, the cord 5 used at present is manufactured with a textured fiber that bears, without breaking, forces (stress) applied to the absorbent body 3 by said blades 41 of the press 40.

The use of a textured fiber in manufacturing the cord 5 prevents the latter from breaking during the process of pressing the absorbent body 3, since such a material enables the cord 5 to elongate and get molded according to the deformation caused on said body 3 by the blades 41 of the press 40.

10 A stress-strain curve of a cord of the present invention is illustrated in Figure 7. An introductory phase, a first phase, and second phase are separated in the vicinity of points P1 and P2, respectively. The first phase yields considerable elongation with limited amount of applied stress, thus exhibiting a relatively small first Young's modulus E1. The second phase has a much steeper linear range, providing a second Young's modulus E2 that is greater than E1. The first phase predominantly alters the material by removing texture therefrom. Therefore, material not having such texture would exhibit only a single-phase stress-strain curve similar to that shown in curve "1" having a Young's modulus corresponding substantially to E2. This cord would have a lesser amount of elongation prior to material failure.

20 A preferred embodiment of the invention having been described, one should understand that the scope of the present invention embraces all possible variations and is only limited by the contents of the claims, including the possible equivalents.

CLAIMS

1. A tampon having a removal cord comprising synthetic fibers, wherein the removal cord has an extensibility of greater than about 25 percent.

5 2. The tampon of claim 1 wherein the cord extensibility is from about 30 to about 200 percent.

3. The tampon of claim 2 wherein the cord extensibility is from about 40 to about 6200 percent.

4. The tampon of claim 1 wherein the synthetic fibers are textured.

10 5. The tampon of claim 4 wherein the texture is helical.

6. The tampon of claim 4 wherein the texture is zigzag.

7. The tampon of claim 1 wherein the removal cord comprises from about 8 to about 25 cables.

15 8. The tampon of claim 7 wherein each cable comprises from about 30 to about 200 fibers.

9. The tampon of claim 1 wherein the synthetic fibers are nylon.

10. A tampon having a removal cord comprising textured synthetic fibers.

11. The tampon of claim 10 wherein the texture is helical.

12. The tampon of claim 10 wherein the texture is zigzag.

20 13. The tampon of claim 10 wherein the synthetic fibers are nylon.

14. A tampon having a removal cord comprising synthetic fibers, wherein the removal cord has a two-phase, tensile stress-strain curve having an inflection point between a first and second phase.

15. The tampon of claim 14 wherein the first phase has a first Young's modulus and the second phase has a second Young's modulus.

16. The tampon of claim 15 wherein the second Young's modulus is greater than the first Young's modulus.

5 17. The tampon of claim 14 wherein the synthetic fibers are textured and stress in the first phase extends the synthetic fibers sufficiently to remove the texture.

18. The tampon of claim 17 wherein the texture is helical.

19. The tampon of claim 17 wherein the texture is zigzag.

10 20. The tampon of claim 14 wherein deformation of the synthetic fibers in the first phase is limited to elastic deformation.

21. The tampon of claim 14 wherein stress in the second phase is sufficient to impart plastic deformation of the synthetic fibers.

22. The tampon of claim 14 wherein the synthetic fibers undergo plastic deformation in the second phase.

ABSTRACT

The present invention refers to an internal hygienic absorbent, also known as a tampon (1), particularly used for absorbing and holding vaginal exudates, such as menstrual blood and intermenstrual secretions.

Tampons (1) are known from the prior art and usually comprise substantially cylindrical body made of an absorbent material (3), suitable for being introduced into the vaginal cavity. A cord (5) is also provided, which projects from one of the ends of the tampon (1) and is intended to enable one to remove said tampon (1) from the vaginal cavity right after its use.

During the method of manufacturing the tampon (1), the absorbent body (3) is subjected to a compaction, and the cord (5) might be broken when an inextensible material is used to make it.

One of the objectives of the present invention is to provide a cord (5) for a tampon (1) that will not be broken or damaged at the time of compacting the absorbent body (3), replacing the cord (5) that has been used at present. This objective is achieved by means of a tampon (1), particularly a tampon for holding vaginal exudates, comprising a substantially cylindrical absorbent body (3) having longitudinal grooves (4) in its surface and comprising a cord (5) suitable for handling said tampon (1), associated to the absorbent body (3), the cord (5) being textured. A method is also described for manufacturing said tampon (1) with the respective textured cord (5).

FIG. 1

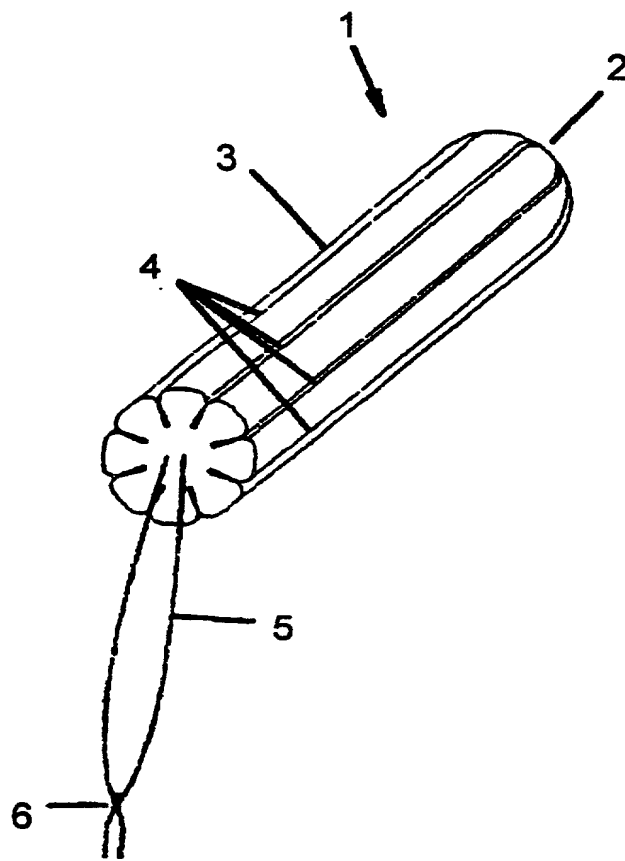


FIG. 2

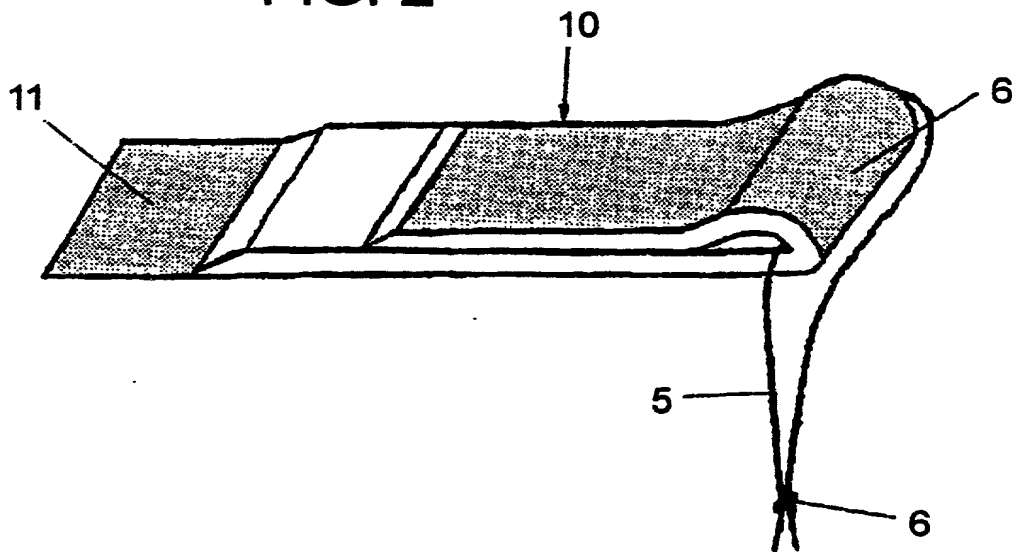
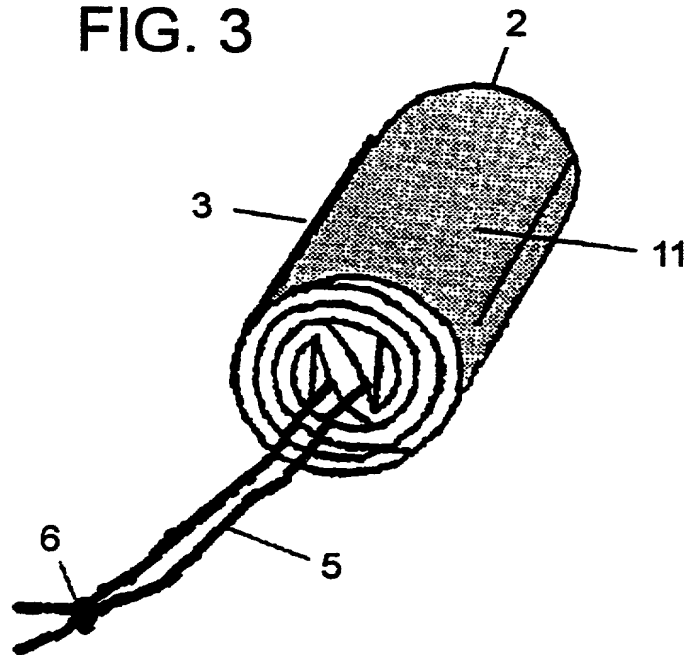


FIG. 3



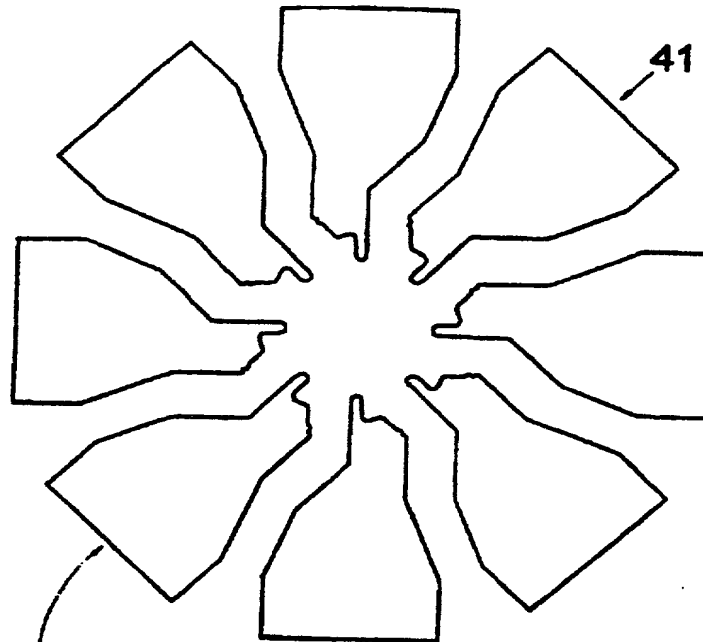


FIG. 4

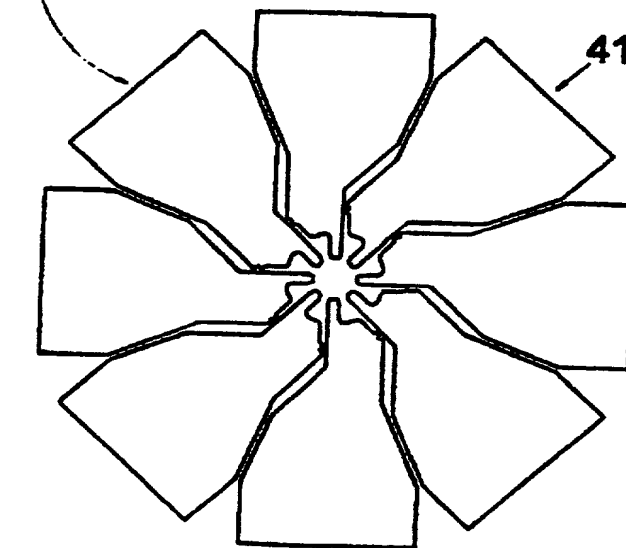


FIG. 5

FIG. 6

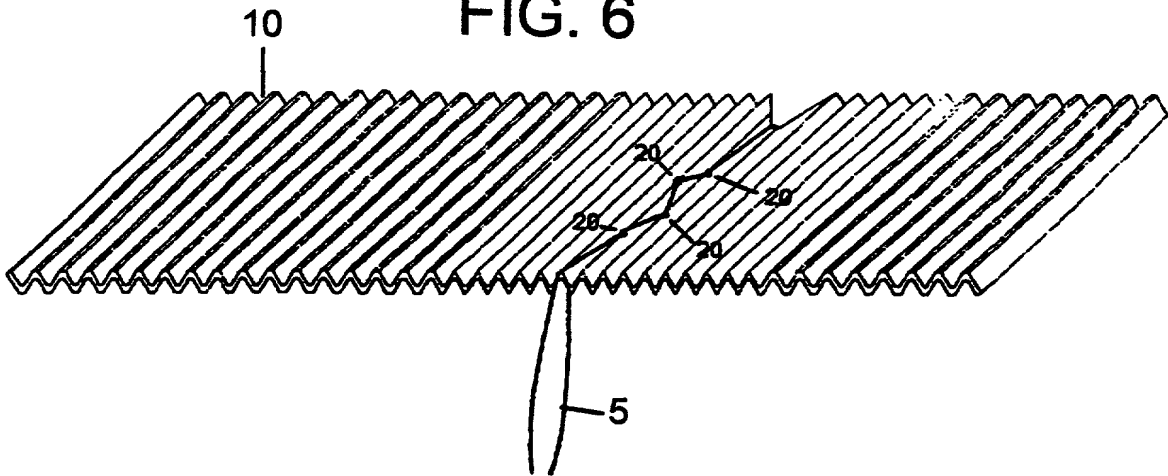
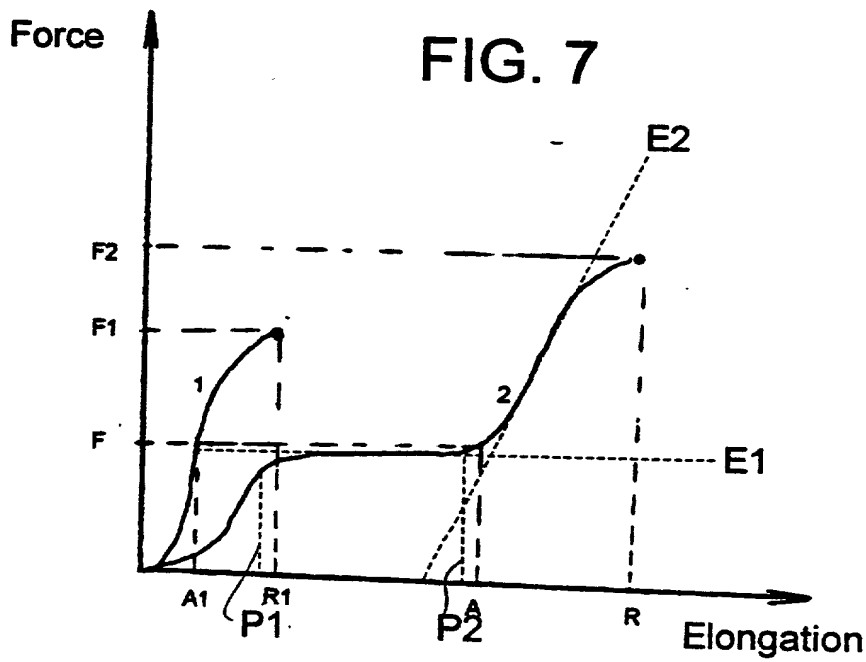


FIG. 7



DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **TAMPON**, the specification of which

(check one) ☒ is attached hereto.

☐ was filed on _____ as

Application Serial No. _____

and was amended on _____.
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s):

Country	Application Number	Date of Filing	Priority Claimed Under 35 U.S.C. 119
PCT	PCT/BR00/00022	17 March 2000	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below:

(Application Number)

(Filing Date)

(Application Number)

(Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No. Filing Date Status

Application Serial No. Filing Date Status

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith as well as to file equivalent patent applications in countries foreign to the United States including the filing of international patent applications in accordance with the Patent Cooperation Treaty:

6 Audley A. Ciamporzero, Jr. (Reg. #26,051), Steven P. Berman (Reg. #24,772), Andrea L. Colby (Reg. #30,194), Michael Stark (Reg. #32,495), Bernard F. Plantz (Reg. #32,091) and Joel A. (Reg. #33,277) One Johnson & Johnson Plaza, New Brunswick, NJ 08933.

06232310

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Igor Philip Passos Broglhof

Date: Sep. 26th

Residence: Rua Euclides Miragaia, 565, ap. 13, Sao Jose dos Campos. SP BRX

Date: _____

Date: _____

Post Office Address:

(Supply similar information and signature for fourth and subsequent joint inventors.)